

10/531548

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
29 April 2004 (29.04.2004)

PCT

(10) International Publication Number  
WO 2004/034847 A1

- (51) International Patent Classification<sup>7</sup>: A47C 3/16 (74) Agent: KLOOSTER, J., H., Ir.; Muller & Eilbracht B.V.,  
P.O. Box 1080, NL-2260 BB Leidschendam (NL).
- (21) International Application Number: PCT/NL2003/000693 (81) Designated States (*national*): AU, CA, CN, JP, KR, MX,  
NO, NZ, PL, RU, TR, US, ZA.
- (22) International Filing Date: 15 October 2003 (15.10.2003)
- (25) Filing Language: Dutch (84) Designated States (*regional*): European patent (AT, BE,  
BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU,  
(26) Publication Language: English IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR).
- (30) Priority Data: 1021674 17 October 2002 (17.10.2002) NL Published:  
— with international search report
- (71) Applicants and  
(72) Inventors: NIEKEL, Edwin, Johannus [NL/NL]; 205,  
Grote Beer, NL-1199 AZ Amstelveen (NL). REGTIEN,  
Taco [NL/NL]; 22 III, Karel du Jardinstraat, NL-1072 SJ  
Amsterdam (NL).  
For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: LIGHT WEIGHT SEATING FURNITURE CONSTRUCTION WITH SO-CALLED MEMORY EFFECT



(57) Abstract: Light weight seating furniture (5) construction with a very high memory effect. The seating furniture is light weight and when constructed as a sphere completely shape-retaining after the removal of the seating load and thereof easy to transport, e.g. by rolling over the floor. The light weight seating furniture (5, 9) construction comprises a shell construction which is deformable under seating load and which is filled up with an number of relatively small shape-retaining particles for support and advancement of the temporary shape-retaining property of this shell construction when a person is positioned thereupon. The shell construction consists of geometrically shaped air permeable shell shaping sheet elements (7, 8) manufactured from porous natural or plastic material with spring back property, as a result of which the shell construction obtains the property of a flexible skeleton structure with memory effect. The particles are manufactured from natural or plastic materials (like polystyrene foam particles) and are optionally packed in a suitable air permeable cover. The external surface of the shell construction may be provided with a desired decorative appearance, like a cover (10) or a printing Furthermore the seating furniture (5, 9) can have a high aesthetic value and is therefore also suitable for advertising and marketing purposes.

WO 2004/034847 A1

Best Available Copy

Light weight seating furniture construction with so-called memory effect.

This invention relates to light weight seating furniture with a very strong memory effect. The seating furniture obtained by application of this seating furniture construction is of light weight and when constructed as a sphere completely shape-retaining after the removal of the seating load and thereby easy to transport, e.g. by rolling over the floor. Furthermore the seating furniture may have a high aesthetic value and is therefore also suitable for advertising and marketing purposes.

A known spherical light weight seating furniture is constructed from hollow, non-porous or inflatable spherical parts manufactured from natural (e.g. rubber) or plastic materials (e.g. PVC) respectively. To obtain the required sphere-shape the hollow internal space is filled with a gas, as e.g. air, and sealed with an air valve mounted on the external surface of the seating furniture. The spring action, in other words, the seating comfort of this seating furniture is determined by the combination of the gas pressure within the completely closed internal space and by the (usual high) required surface tension of the material concerned. To reach the required surface tension in the spherical seating furniture a relatively high gas pressure must be applied, which is disadvantageous for obtaining an optimal seating comfort. On the one hand the seating stability becomes too low, and on the other hand the spring action will remain very limited. Furthermore this seating furniture is susceptible to variation in the surrounding temperature which results in a too low/ too high gas pressure in the internal space thereby directly affecting the shape and its seating properties. Another restriction lies in the susceptibility to mechanical damage by a sharp object when the seating furniture is used outside. In another embodiment, according to US 6279184, a spherical seating furniture is provided with thin gas permeable internal and external segments. The seating furniture is filled up with a plurality of polyurethanes foam particles for increasing the seating comfort and shape-retaining property. The essence of this object is based in the special design of the shell elements, whereby the sphere-shape is

obtained by mutually interconnecting two parallelly positioned circular segments with a square shell segment positioned in between.

This construction misses a sufficient, so-called, memory effect, in other words the property that a deformation caused by the weight load of a sitting person will disappear when this person rises. Another major disadvantage is the complex construction with two shells resulting in a high susceptibility to mechanical damages.

In its special embodiment according to the invention the new light weight seating furniture construction with memory effect offers an optimal solution for the above mentioned problems. This memory effect is understood as to mean that after the removal of the sitting load caused by a sitting person, which results in great deformation, the seating furniture construction completely regains its original shape.

The essence of the invention is the application of a special seating furniture construction, which is provided with a spring back skeleton comprising a plurality of geometrically shaped, air permeable, shell shaping, sheet elements that are mutually interconnected into a spherical shell by means of adhesive means. The aforesaid sheet elements are constructed from porous, spring back, natural material, like e.g. foam rubber or plastic material, like e.g. poly-ethylene, or another usual material for construction of e.g. mattresses.

The geometrically shaped, air permeable, shell shaping, sheet elements used as basic elements, may have all known shapes like e.g. a triangle, a quadrilateral, a pentagon, hexagon, heptagon, octagon etc., or a combination thereof. The mutual interconnection of the flat connecting surfaces of said shell elements is affected with adhesive means, like e.g. a tixotropic adhesive, which can be applied and distributed easily over the connecting surfaces. After the drying/hardening of the adhesive means, and the inherently increased stiffness at the position of the interconnections, these connecting surfaces will subsequently form a skeleton structure for obtaining a high memory effect for the complete shell construction.

The hollow internal space enclosed by the shell construction will be partially filled with an number of relatively small particles (grains) manufactured from a natural or plastic material, as e.g. polystyrene foam. These shape-retaining grains essentially are used to support the temporary shape-retaining property of the shell construction.

When a person sits or lies down on the seating furniture the shell construction will be deformed and the grains on the inside will move like a liquid. This results in a stable, and thus comfortable distribution of the pressure around the body of the sitting or laying person. When the person rises, the spring back skeleton will regain its original sphere-shape, whereby the grains will be displaced again. These grains can be filled directly into the hollow space of the shell construction, but they may also be packed in a suitable, air permeable, wide flexible cover like a bag or the like.

In a certain embodiment, e.g. a smaller seating furniture for children, the furniture construction can be constructed from two sphere-segments, e.g. two halves of a sphere. The effect of a flexible skeleton structure with high memory effect property may be obtained by means of the integration of suitable separate skeleton segments in said sphere-segments during its manufacture, as e.g. during the moulding process. These skeleton element, as were they real bones of a skeleton, may be manufactured e.g. from plastic or another spring back material.

By application of said light weight furniture construction which maintains its shape-retaining properties during sitting or lying down, the seating furniture can easily be moved e.g. by rolling over the floor. Furthermore on the one hand this seating furniture has a high aesthetic value and is therefore very suitable for advertisements and marketing purposes. The seating furniture may be shaped as a playing ball or as a celestial body (globe, moon etc.) and/or it may be provided on its external surface with one or more pictures, colour surfaces, advertisements, logo's etc.

The invention will now be described, by means of embodiments thereof, with reference to the accompanying drawings 1-11 wherein:

- Fig. 1 is an known spherical seating furniture according to US 6279184;
- 5 Fig. 2 is a seating furniture during use, according to the invention;
- Fig. 3 is a side view of a number of mutually interconnected shell shaping sheet elements of the spherical light weight seating furniture construction with increased memory effect according to the invention;
- 10 Fig. 4 is a side view of a greater number of mutually interconnected shell shaping sheet elements than shown in Fig.3 ;
- Fig. 5 is a side view of the spherical light weight seating furniture construction with increased memory effect whereby only one sheet element is missing according to the invention;
- 15 Fig. 6 is a side view of spherical light weight furniture construction with increased memory effect, partially enclosed (covered) with a decorative/protective cover layer;
- Fig. 7 is a side view of complete seating furniture obtained by applying the spherical light weight seating furniture construction;
- 20 Fig. 8 is a schematic view of a number of other three-dimensional embodiments of the light weight seating construction with increased memory effect;
- Fig. 9 is a schematic view of a number of other embodiments of the nearly spherical light weight seating construction with increased memory effect;
- 25 Fig. 10 is a schematic view of a number of embodiments of the patterns of the base elements for use in the spherical light weight seating construction with increased memory effect;
- Fig. 11 is a schematic view of a number of other embodiments of patterns of the base elements for use in a spherical light weight seating furniture construction with increased memory effect.
- 30 According to Fig. 1 the known seating furniture X in US 6279184 is provided with thin, gas permeable, internal and external surface segments – a left segment 1 and a right segment 2 – and interposed a square shell segment 3. Square shell

segment 3 and also the free ends of the internal surface segments (not shown) are closed by means of an oblong portion 4.

5 A seating furniture 5 according to the invention with a thereon seated person 6 is shown in Fig.2, whereby the dimensions and the spring back of the seating furniture 5 are adjusted for use by a grown up person 6.

10 In another embodiment of the seating construction according to the invention the pentagonal and hexagonal base elements are in such a way combined and mutually interconnected, that the known shape of a soccer bal (older types) is obtained. [Fig.3 -7 show some phases of the assembly of the seating furniture construction and seating furniture resulting there from]

Fig.3 shows a base pattern of shell shaping sheet elements 7,8 constructed from a central pentagonal element 7 which is surrounded by five hexagonal elements 8. 15 According to Fig.4 this base pattern may be extended further by a number of pentagonal elements 7 or hexagonal elements 8 respectively thereby enclosing sphere-shape 9. According to Fig.5 the pentagonal elements 7 and hexagonal elements 8 assembled seating furniture 9 misses the last closing pentagon element. In this phase the seating furniture construction 9 may be partially or 20 completely filled with a number of relatively small shape-retaining grains (not shown) manufactured from natural or plastic material and thereupon sealed with a pentagonal element (not shown). Furthermore this seating furniture construction may be finished with a decorative/protective cover 10, as shown in Fig.6 and 7. In Fig.6 the seating furniture construction 9 is a partially enclosed (covered) version 25 with a cover 10. According to Fig.7 the cover is completely mounted and as an enclosing cover mounted on the seating furniture 9 respectively, thereby completing the seating furniture as shown in Fig.2.

30 An overview of other alternative possible three-dimensional embodiments of the seating furniture according to invention is shown in Fig.8 and 9. In Fig.8 are shown the tetrahedron 11, cube 12, octahedron 13, dodecahedron 14, icosahedron 15, truncated octahedron 16, cuboctahedron 17, truncated cube 18, and truncated octahedron 19. Further in Fig.9 are shown small rhombicuboctahedron 20, great

rhombicuboctahedron 21, snub cube 22, icosidodecahedron 23, truncated dodecahedron 24, truncated icosahedron 25, small rhombicosidodecahedron 26 and a great rhombicosidodecahedron 27. Some of the different possible pattern-shapes for use in a seating furniture construction according to invention are shown in Fig.10 and 11. Shown are patterns constructed from: hexagon/semi-triangle 28, hexagon/quadrilateral/triangle 29, dodecagon/hexagon/quadrilateral 30 and octagon/quadrilateral 31. Furthermore in Fig.11 are shown two shape variations of a quadrilateral/triangle pattern 32a and 32b and also two shape variations of a hexagon/triangle 33a and 33b.

10

It is obvious that within the scope of the invention an unlimited amount of similar solutions will be possible. For advertising purposes the seating or lying down furniture may have the shape of a beer can or of a magnum ice cream or similar.

15

When a small three-dimensional shape as e.g. a baby chair is chosen, it can be established by experiment how the thickness of the wall of the skeleton material corresponds to the required seating shape-retaining property and even if the filling with grains can be omitted. With a cylindrical three-dimensional shape the seating furniture can offer place to two or more persons or can be used as a couch. To put it shortly many applications may be thought of based on the same principles of the invention.

20

## CLAIMS

5

1. Light weight seating furniture construction, in particular with the appearance of a sphere-shape or of an other three-dimensional geometrical shape, like a cylinder, with memory effect, in other words that after the removal of the seating load (caused by a sitting person) which results into a deformation, the seating furniture construction completely regains its original shape, comprising:
  - 10 a. a shell construction which is deformable under seating load, which construction consists of geometrically shaped air permeable shell shaping sheet elements manufactured from porous natural or plastic material having the property to spring back in its original shape, whereby the shell construction comprises the property of a flexible skeleton structure with memory effect; whereby the external surface of the shell construction may be provided with a desired decorative external surface, like a cover or a printing, and furthermore the shell construction is provided internally with a hollow internal space which is suitable for partially filling up with
  - 15 b. a number of relatively small shape-retaining particles for support and advancement of the temporary shape-retaining property of the shell construction once a person is seated thereupon, which particles are manufactured from natural or plastic material (like polystyrene foam particles) and which particles are optionally packed in a suitable air permeable cover.
  - 20
  - 25
2. Light weight seating furniture construction with memory effect according to claim 1, characterized in that the flexible skeleton structure is obtained with a plurality of geometrically shaped air permeable sheet elements together
- 30 shaping the shell, which are mutually interconnected into a three-dimensional geometrical shell by means of adhesive means.



3. Light weight seating furniture construction with memory effect according to claim 1, characterized in that the high memory effect operation of the flexible structure is obtained by fully integrating the suitable different skeleton segments into the shell construction as three-dimensionally shaped geometrical segments, which are manufactured from e.g. plastic material
- 5
4. Light weight seating furniture construction according to any one of the claims 1 -2, characterized in that the geometrically shaped three-dimensional shell elements of the shell construction are provided with a geometrically polygonal shape like a triangle, square, quadrilateral, pentagon, hexagon, etc.
- 10
5. Light weight seating furniture construction according to any one of the claims 1 -4, characterized in that the shell construction has the appearance of an imperfect sphere-shape of a tetrahedron, cube, octahedron, dodecahedron, icosahedron, truncated tetrahedron, cuboctahedron, truncated cube, truncated octahedron, small rhombicuboctahedron, great rhombicuboctahedron, snub cube, icosidodecahedron, truncated dodecahedron, truncated icosahedron, small or great rhombicosidodecahedron, etc. or of a combined (hybrid) shape thereof.
- 15
- 20
6. Light weight seating furniture obtained by using the spherical light weight seating furniture construction according to one or more of the preceding claims 1-5, characterized by the shape of a great playing ball or as a celestial body (globe, moon, etc.) and/or providing on its external surface one or more images, colour area's, advertisements, logos, etc.
- 25
7. Light weight seating furniture obtained by using the spherical light weight seating furniture construction according to one or more of the preceding claims 1-6, characterized by geometrically shaped air permeable shell shaping sheet elements having an external diameter between 50 and 200 cm and a wall thickness of at least 3 to 20 cm.
- 30

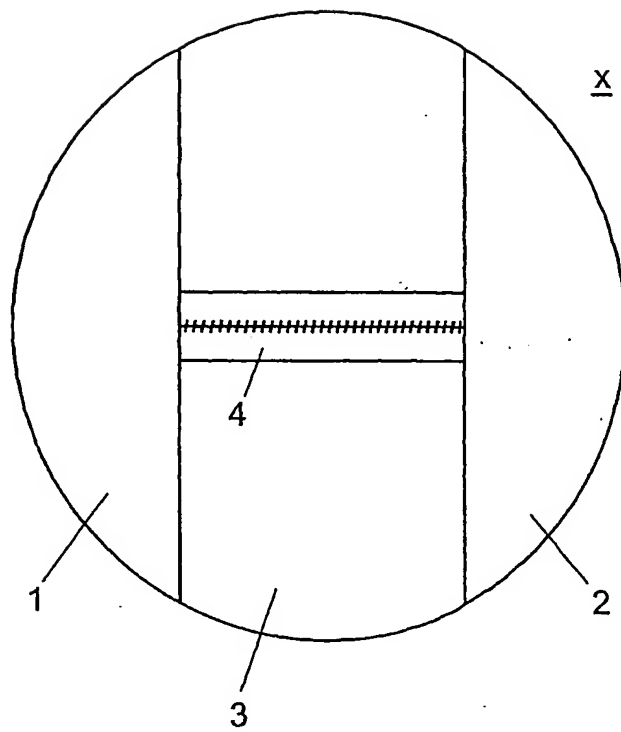


FIG. 1



FIG. 2

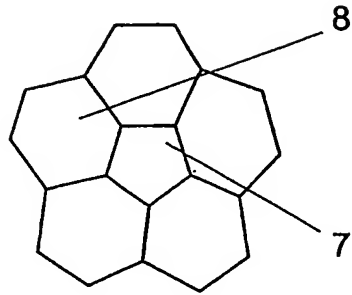


FIG. 3

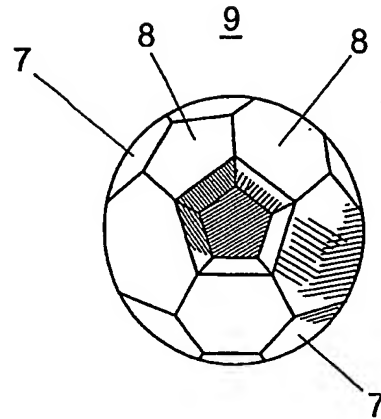


FIG. 5

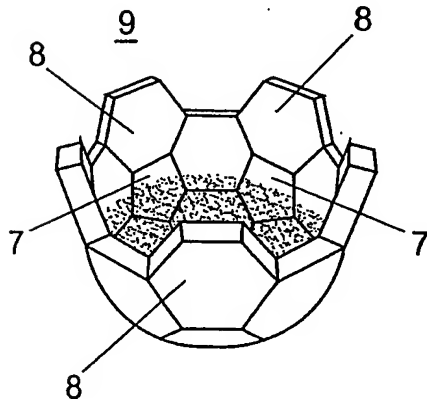


FIG. 4

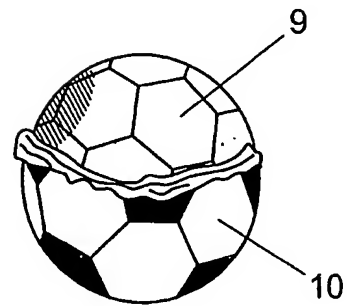


FIG. 6

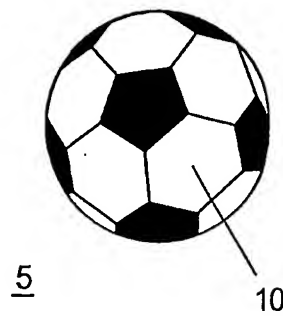


FIG. 7

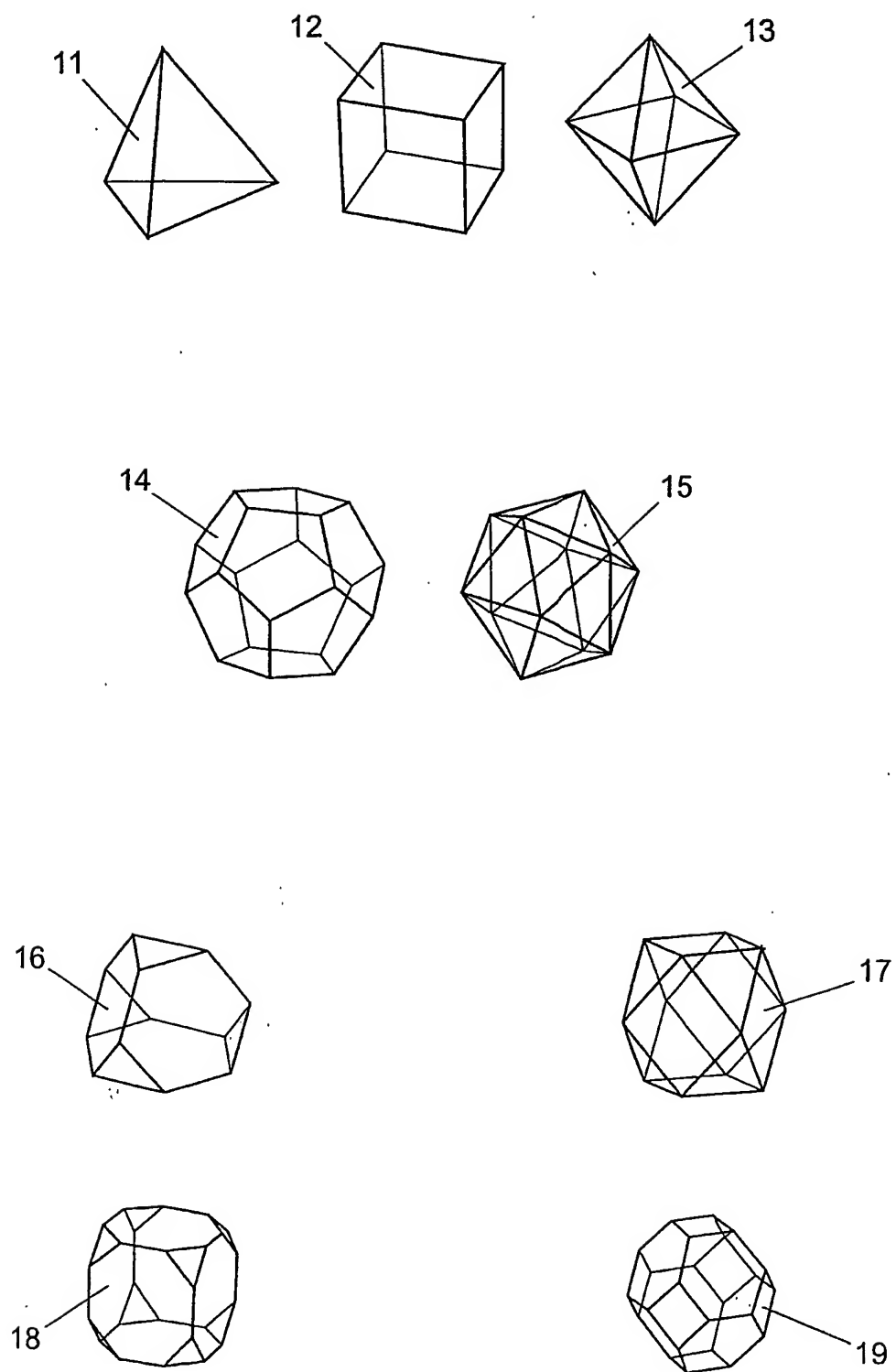


FIG. 8

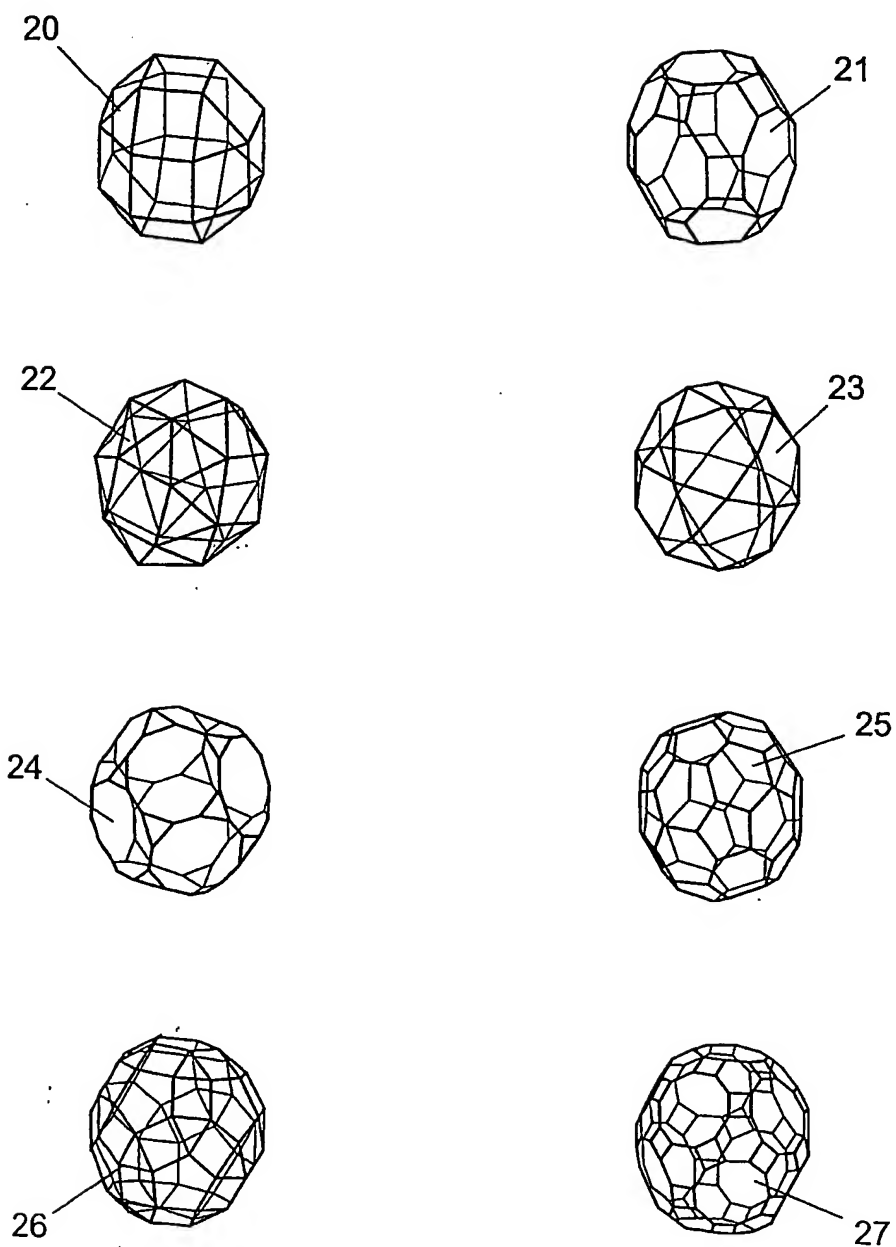


FIG. 9

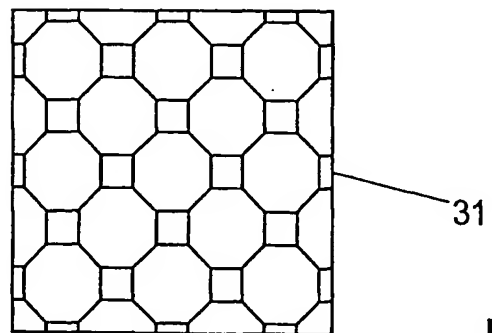
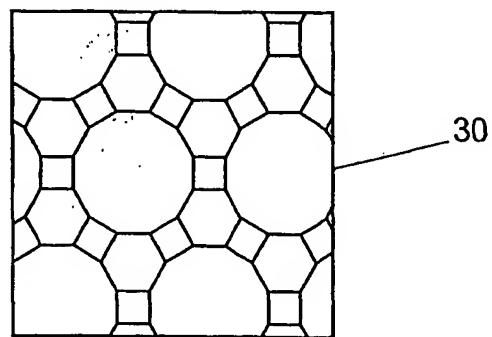
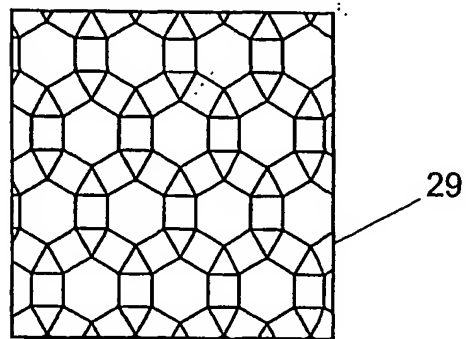
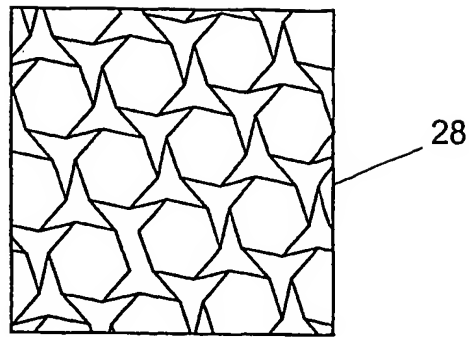


FIG. 10

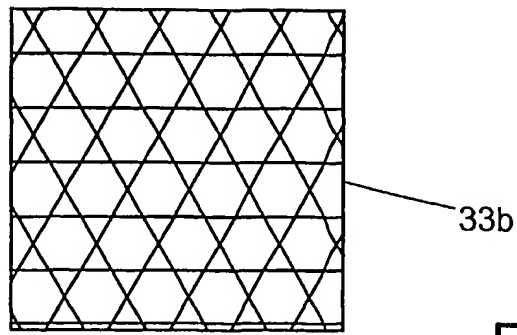
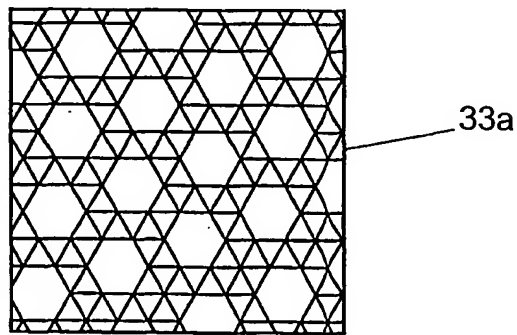
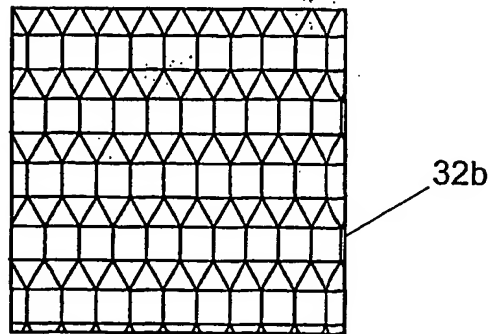
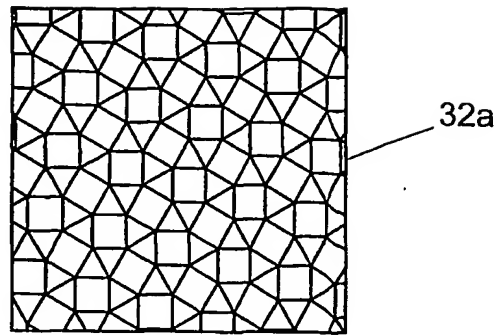


FIG. 11



# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/NL 03/00693

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A47C3/16

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 A47C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 181 948 A (HOBART ROSE LIMITED) 7 May 1987 (1987-05-07) page 1, left-hand column, line 39-53; figures ---	1-7
X	FR 2 597 316 A (AILLAUD JACQUES) 23 October 1987 (1987-10-23) page 1, line 8,36-38; claims 4,6; figures ---	1-7
A	GB 1 541 865 A (UNIROYAL PTY LTD) 14 March 1979 (1979-03-14) column 1, paragraph 2; figures ---	1
A	US 3 495 874 A (DEAN WILLIAM ROGER) 17 February 1970 (1970-02-17) column 3, line 13-15; claim 1; figures --- -/--	1,2,6

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*G\* document member of the same patent family

Date of the actual completion of the international search

4 February 2004

Date of mailing of the international search report

12/02/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Amghar, N

## INTERNATIONAL SEARCH REPORT

Intern. Application No  
PCT/NL 03/00693

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 518 115 A (KOSTAR DAUNEN PRODUKTE GMBH) 16 December 1992 (1992-12-16) abstract; figures -----	

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/NL 03/00693

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 2181948	A	07-05-1987	NONE	
FR 2597316	A	23-10-1987	FR 2597316 A1	23-10-1987
GB 1541865	A	14-03-1979	NONE	
US 3495874	A	17-02-1970	BE 712687 A FR 1556716 A GB 1189130 A NL 6804914 A	23-09-1968 07-02-1969 22-04-1970 30-12-1968
EP 0518115	A	16-12-1992	DE 4119050 A1 EP 0518115 A1	17-12-1992 16-12-1992

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☒ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☒ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☒ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER: \_\_\_\_\_**

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**